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PROVISIONAL SPECIFICATION

A Process for Coating Surfaces of Slate, Concrete or Brickwork

We, COLLOIDAL COLOURS LIMITED, Registered Office, Ynystowyn, Portmadoc, Carnarvonshire, Wales, a British Company, and REGINALD GRAHAM, 5 DURRANT, of Rosetua, Marlborough, Wiltshire, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention concerns a process for coating surfaces of slate, concrete or brickwork with gels prepared from sols, for instance, those produced from the hydroxides of iron or chromium.

According to the invention the process for coating surfaces of slate, concrete or brickwork consists in applying to the surface as by spraying, painting, dipping or pouring over a sol, prepared from a hydroxide of iron or chromium containing, if desired, admixtures such as one or more powders which may be white or coloured but do not act as electrolytes or have any adverse effect upon the sol, allowing the sol to dry or become substantially dry so as to form a film on the surface, then applying in any convenient manner an electrolyte such as a solution of ammonium sulphate, potassium ferrocyanide or sodium silicate thereby forming a gel in situ on the surface and then application of heat as by warming.

A large variety of tints may be imparted to the gels by selecting the powders serving as admixtures. Thus sols of ferric hydroxide, without admixtures, give brown gels but produce green tinted gels if mixed with chromium oxide, red tinted gels if mixed with ferric oxide and buff tinted gels if admixed with ochre. Sols of chromium hydroxide produce green gels which similarly may be modified with appropriately coloured powders. Mixtures of powders may be employed. If desired the admixtures may be applied, as by blowing, to the applied sol before it has dried.

The sols may be prepared so as to contain free acid in sufficient quantity to act on the surface of slate, concrete and brick work to which they are applied and in this way, for example, a film of silicic acid may be formed on the underneath

[Price, 1/-]

surface of the applied sol so that gel formation commences on the underneath surface of the sol film and when the electrolyte is applied to the outer surface of the sol film, gel formation becomes general throughout the film of sol. The gels harden on, still more closely, with age.

In an embodiment of the invention a sol of ferric hydroxide suitable for carrying out the present process may be made as follows:—

A concentrated solution of ferric chloride in water is precipitated by excess of caustic alkali or ammonia. The resulting ferric hydroxide is filtered and well washed with water to remove chloride together with excess of alkali. After washing, pressure is applied to consolidate the cake and ferric hydroxide and this cake is peptised with a reserved portion of the ferric chloride solution. This portion should not be less than one eighth and not more than one quarter of the quantity employed in producing the cake.

The liquid sol, so obtained, may be diluted roughly to three times its original volume. After this dilution its consistency will be found suitable for application. Alternatively the sol may be evaporated down to the solid state and subsequently be dissolved in water up to a suitable concentration (viz. about twice normal for ferric iron—equivalent normality—i.e. 18.6 grams per litre = normal).

The diluted sol is painted or sprayed on to, for instance, slate to give a film which, when dry, is treated with a sodium silicate solution, for example $\text{Na}_2\text{O} \cdot 4\text{SiO}_2 \cdot 30\text{H}_2\text{O}$ such as that known as V.W.60 (I.C.I.) diluted with about eight times its weight of water. The silicate solution is sprayed on to the sol film and, when dry, yields a gel which adheres to the surface. The gel has been found to harden on, still more closely, with age.

The proportion of electrolyte required to be added to the sol to form the gel varies with the composition and concentration of the sol.

By means of this invention very pleasing and lasting tints of varying colours and shades may be imparted to the surfaces of the originating materials. Thus ordinary slate may be caused to assume, for example, a reddish or greenish tint by incorporating suitable colouring powders into the sol before it is applied

to the surface.

Dated this 30th day of January, 1934.
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Patent Agent,
20 to 23, Holborn, London, E.C.1,
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COMPLETE SPECIFICATION

A Process for Coating Surfaces of Slate, Concrete or Brickwork

10 We, COLLOIDAL COLOURS LIMITED,
Registered Office, Ynystowyn, Port-
madoc, Carnarvonshire, Wales, a British
Company, and REGINALD GRAHAM
15 DERRANT, of Rosetna, Marlborough,
Wiltshire, a British Subject, do hereby
declare the nature of this invention and
in what manner the same is to be per-
formed, to be particularly described and
20 ascertained in and by the following state-
ment:—
This invention concerns a process for
coating surfaces of slate, concrete, or
brickwork, which latter expression in-
cludes tiles, with gels obtained from sols
25 prepared from the hydroxides of iron or
chromium or mixtures of such sols.
According to the invention the process
for coating surfaces of slate, concrete, or
brickwork consists in applying to the sur-
30 face a sol prepared from a hydroxide of
iron or chromium or a mixture of such
sols with or without admixtures of one or
more substances either white or coloured
but not acting as electrolytes or affecting
35 adversely the sol, drying or substantially
drying the sol to form a film on the sur-
face, applying thereto an electrolyte to
convert the sol into a gel and drying the
gel.
40 According to the invention also the pro-
cess for coating surfaces of slate, concrete,
or brickwork consists in applying a coating
of concentrated acid or concentrated solu-
tion of alkali or other electrolyte in solu-
45 tion, to the surface, which solutions react
on the surfaces to form a coagulant film,
drying the coating, applying to the
treated surface a sol prepared from a
hydroxide of iron or chromium or a mix-
50 ture of such sols, with or without
admixtures of one or more substances
either white or coloured but not acting
as electrolytes or adversely affecting the
sol, and drying.
55 In this latter process for instance in
the case of slates, electrolytes in solution
may, if desired, may be applied to the
surfaces after the second drying operation.
Examples of electrolytes which may be
60 employed are solutions of ammonium sul-

phate or potassium ferrocyanide or sodium silicate.

Examples of admixtures which may be added to the sols are finely divided, red oxide of iron, green oxide of chromium, black oxide of manganese, smalt and ochre. The admixtures may be added to the sols themselves or may be incorporated with the sols in the dessicated forms. In the latter case sufficient water is added to bring the sols into the condition required for applying them to the surfaces. The sols may conveniently be used in twice normal concentration, that is containing 37.3 grs. of iron or 34.6 grs. of chromium per litre. The sols may be applied to the surfaces by spraying, painting, or pouring over or the surfaces may be dipped into the sols. In all cases the coating of sols should be dry or substantially dry before the subsequent application of the electrolytes for otherwise it has been found that the gels will not adhere to the surfaces but rub off quite easily.

The electrolytes may be applied to the dried sols in a similar manner.

In an embodiment of the invention a sol of ferric hydroxide suitable for carrying out the present process may be made as follows:—

A concentrated solution of ferric chloride in water is precipitated by excess of caustic alkali or ammonia. The resulting ferric hydroxide is filtered and well washed with water to remove chloride together with excess of alkali. After washing, pressure is applied to consolidate the cake of ferric hydroxide and this cake is peptised with a reserved portion of the ferric chloride solution. This portion should not be less than one eighth and not more than one quarter of the quantity employed in producing the cake.

The liquid sol, so obtained, may be diluted roughly to three times its original volume. After this dilution its consistency will be found suitable for application. Alternatively the sol may be evaporated down to the solid state and subsequently be dissolved in water up to

a suitable concentration (viz. about twice normal for ferric iron—equivalent normality—i.e. 18.6 grams per litre = normal).

- 5 The diluted sol is painted or sprayed on to, for instance, slate to give a film, which, when dry, is treated with a sodium silicate solution, for example $\text{Na}_2\text{O} \cdot 4\text{SiO}_2 \cdot 36\text{H}_2\text{O}$ such as that known as V.W.60 (I.C.I.) diluted with about an equal weight of water. The silicate solution is sprayed on to the sol film and, when dry, yields a gel which adheres to the surface. The gel has been found to harden
- 10 on, still more closely, with age.

The proportion of electrolyte required to be added to the sol to form the gel varies with the composition and concentration of the sol.

- 20 To prepare a sol of chromium hydroxide, ammonia is used for precipitating the chromium hydroxide from a solution of chromium chloride. The peptisation is effected with one fifth of the amount of concentrated solution of chromium chloride used to prepare the cake of chromium hydroxide.

- It has been ascertained that sols prepared from ferric hydroxide contain free acid and when the sol is applied to the surface of slate, or brickwork, on drying, the acid acts on the surface giving silicic acid which acts as a coagulant on the sol so that in this case the gel formation commences on the underneath surface of the sol film and in time converts the sol into a gel. To expedite the gel formation, however, an electrolyte in solution is applied to the outer surface of the sol film when this is dry or substantially dry with the result that gel formation becomes general throughout the film of sol. Sols of chromium hydroxide contain very little acid and hydrochloric acid may be added
- 30 to the sol.

- A large variety of tints may be imparted to the gels by selecting the powders serving as admixtures. Thus sols of ferric hydroxide, without admixtures, give brown gels but produce green tinted gels if mixed with chromium oxide, red tinted gels if mixed with ferric oxide and buff tinted gels if mixed with ochre. Sols of chromium hydroxide produce green gels which similarly may be modified with appropriately coloured powders. Thus if smalt is added they give blue tints. Mixtures of powders may be employed. If desired the admixtures may be applied, as by blowing, to the applied sol before it has dried. Thus ochre admixed with green oxide of chromium gives a pleasant yellowish green tint while ochre mixed with a little red oxide of iron gives a terra cotta tint to the ferric gel.

By means of this invention very pleasing and lasting tints of varying colours and shades may be imparted to the surfaces of the originating materials. Thus ordinary slate may be caused to assume, for example, a reddish or greenish tint by incorporating suitable colouring powders into the sol before it is applied to the surface.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A process for coating surfaces of slate, concrete or brickwork, which consists in applying to the surface a sol prepared from a hydroxide of iron or of chromium, or a mixture of such sols, with or without admixtures of one or more substances either white or coloured but not acting as electrolytes or adversely affecting the sol, drying or substantially drying the sol to form a film on the surface, applying thereto an electrolyte to convert the sol into a gel and drying the gel.

2. A process for coating surfaces of slate, concrete, or brickwork which consists in applying a coating of concentrated acid or concentrated solution of alkali or other electrolyte in solution to the surface, which solutions react on the surfaces to form a coagulant film, drying the coating, applying to the treated surface a sol prepared from a hydroxide of iron or chromium or a mixture of such sols, with or without admixtures of one or more substances either white or coloured but not acting as electrolytes or adversely affecting the sol, and drying.

3. A process as claimed in claim 2 wherein electrolytes in solution are applied to the surfaces after the second drying operation.

4. A process as claimed in any of the preceding claims wherein the sols applied to the surfaces contain free acid.

5. A process as claimed in any of the preceding claims wherein sols containing finely divided red oxide of iron or green oxide of chromium or black oxide of manganese or smalt or ochre are employed.

6. A process as claimed in claims 1, 3, 4 or 5 wherein solutions of ammonium sulphate, potassium ferrocyanide or sodium silicate are employed as the electrolytes.

7. Surfaces of slate, concrete or brickwork when treated by the process claimed in any of the preceding claims.

8. Slates or tiles when coloured on their surfaces by the process claimed in any of the preceding claims 1 to 6.

Dated this 16th day of July, 1934.

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